Specimen Question **Annexure-XXXIV**

DO NOT OPEN THE SEAL UNTIL YOU ARE TOLD TO DO SO

QP-FSL-2024 **Question Booklet No.**

CHEMISTRY

PAPER—II

Test Booklet Series

A

Time Allowed : 2 Hours **Maximum Marks : 200**

INSTRUCTIONS FOR CANDIDATES

1. Immediately after the commencement of the examination, you should check that this Test Booklet ***does not*** have any unprinted or torn or missing pages or questions etc. If so, get it replaced by a complete Test Booklet.

2. Write your Roll Number on the Test Booklet in the Box provided alongside.

3. This Test Booklet contains **200** questions. Each question comprises of four responses (answers) within as (A), (B), (C) and (D). You should select the response which you feel is the most ***correct*** and mark it on the OMR Answer Sheet.

4. You have to mark all your responses **ONLY** on the separate **OMR Answer Sheet** provided. Also read the directions in the **OMR Answer Sheet**. Fill in all the entries in the OMR Answer Sheet ***correctly***. **DO NOT WRITE/MARK ANYTHING EXCEPT IN THE SPACE PROVIDED FOR IT,** failing which your OMR Answer Sheet ***shall not*** be evaluated.

5. **Count** the number of **questions attempted** carefully and write it down in the space provided **in the OMR Answer Sheet**.

6. After you have completed filling in all your responses on the **OMR Answer Sheet** and the examination has concluded, **you should hand over** to the Invigilator **only the OMR Answer Sheet (in original). You are permitted to take away 2nd Copy of the OMR Answer Sheet and Test Booklet.**

7. Each question carries 1 mark.

8. Candidature would be cancelled in case of non-compliance with any of these instructions.

9. **Penalty for wrong answers :**

   THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.

   (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, 0·5 mark of the marks assigned to that question will be deducted as penalty.

   (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.

   (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be no penalty for that question.

10. **"Mobile phones, calculators, IT gadgets, smart watch and any other electronic devices such as Bluetooth etc. are not allowed inside the premises where the examination is being conducted. Any infringements of these instructions shall entail disciplinary action including ban from future examinations."**

SEAL

DO NOT OPEN THE SEAL UNTIL YOU ARE TOLD TO DO SO

1. Choose the ***correct*** statement.

(A) Designation for the orbital with the quantum numbers $n = 3$, $\ell = 1$, $m = -1$ may be $3p_x$ or $3p_y$

(B) Designation for the orbital with the quantum numbers $n = 4$, $\ell = 2$, $m = +2$ may be $4d_{xy}$ or $4d_{x^2-y^2}$

(C) Designation for the orbital with the quantum numbers $n = 5$, $\ell = 0$, $m = 0$ may be $5s$

(D) Designation for the orbital with the quantum numbers $n = 2$, $\ell = 1$, $m = 0$ may be $3p_z$

2. What would be the minimum uncertainty in de Broglie wavelength of a moving electron accelerated by potential difference of 6 volt and whose uncertainty in position is $\frac{7}{22}$ nm ?

(A) 6·25 Å

(B) 6 Å

(C) 0·625 Å

(D) 0·3125 Å

3. An excited state of H-atom emits a photon of wavelength λ and returns in the ground state, the principal quantum number of excited state is

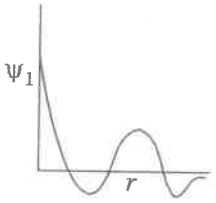
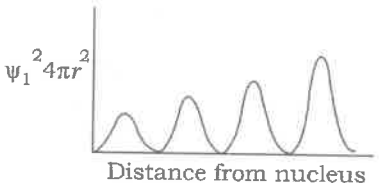
(A) $\sqrt{\lambda R(\lambda R - 1)}$

(B) $\sqrt{\frac{\lambda R}{(\lambda R - 1)}}$

(C) $\sqrt{\lambda R(1 - \lambda R)}$

(D) $\sqrt{\frac{(\lambda R - 1)}{\lambda R}}$

4. Four statements (A), (B), (C) and (D) are given in **Column—I** and four statements (p), (q), (r) and (s) in **Column—II**. Identify the statement in **Column—I** which can have ***correct*** matching with the corresponding statement in **Column—II**.

Column—I	**Column—II**
(A) 	(p) $2s$
(B) 	(q) $4p_y$
(C) Angular probability is dependent of θ and ϕ	(r) $3s$
(D) At least two angular nodes are present	(s) $3d_{xy}$

5. Select the ***incorrect*** statement about N_2F_4 and N_2H_4.

(I) In N_2F_4, d-orbitals are contracted by electronegative fluorine atoms, but d-orbital contraction is not possible by H-atom in N_2H_4.

(II) The N — N bond energy in N_2F_4 is more than N — N bond energy in N_2H_4.

(III) The N — N bond length in N_2F_4 is more than that of in N_2H_4.

(IV) The N — N bond length in N_2F_4 is less than that of in N_2H_4.

Choose the ***correct*** code :

(A) (I), (II) and (III)

(B) (I) and (III)

(C) (II) and (IV)

(D) (II) and (III)

6. Which of the following statements is ***incorrect***?

(A) Among O_2^+, O_2 and O_2^- the bond length decreases as $O_2^- > O_2$ and O_2^+

(B) He_2 molecule does not exist as the bonding and anti-bonding orbitals cancel each other

(C) C_2, O_2^{2-} and Li_2 are diamagnetic

(D) In F_2 molecule, the energy of $^{\sigma}2p_z$ is more than $^{\pi}2p_x$ and $^{\pi}2p_y$

7. Select the pair of compounds in which both have different hybridization but have same molecular geometry.

(A) BF_3, BrF_3

(B) $ICl_2^{\ominus}$, $BeCl_2$

(C) BCl_3, PCl_3

(D) PCl_3, NCl_3

8. The following molecules/species have been arranged in the order of their increasing bond orders. Identify the ***correct*** order :

(I) O_2 (II) O_2^- (III) O_2^{2-} (IV) O_2^+

(A) (III) < (II) < (I) < (IV)

(B) (IV) < (III) < (II) < (I)

(C) (III) < (II) < (IV) < (I)

(D) (II) < (III) < (I) < (IV)

9. Arrange the following compounds in increasing order of dipole moments : (I) toluene; (II) *o*-dichlorobenzene; (III) *m*-dichlorobenzene and (IV) *p*-dichlorobenzene.

(A) (IV) < (I) < (II) < (III)

(B) (I) < (IV) < (II) < (III)

(C) (IV) < (I) < (III) < (II)

(D) (IV) < (II) < (I) < (III)

10. A hypothetical ionic compound *AB* (mol. wt. = 240 g/mole), having coordination number of anion equal to 6, has a closest anion-anion distance of $4\sqrt{2}\,\mathring{A}$. Determine the density of ionic compound *AB* in gm/cc.

(A) 6·24

(B) 3·12

(C) 1·56

(D) 0·78

11. Select the ***incorrect*** statement.

(A) The C.N. of cation occupying a tetrahedral hole is 4

(B) The C.N. of cation occupying an octahedral hole is 6

(C) In Schottky defects, density of the lattice decreases

(D) None of the above

12. A substance A_xB_y crystallizes in a Face Centred Cubic (FCC) lattice in which atoms A occupy each corner of the cube and atoms B occupy the centres of each face of the cube. Identify the ***correct*** composition of the substance A_xB_y.

(A) AB_3

(B) A_4B_3

(C) A_3B

(D) Composition cannot be specified

13. When NaCl crystal is heated in sodium vapors, then it attains yellow colour. It is due to

(A) electrons trapped in cation vacancies

(B) F-centres, which is electron trapped in anion vacancy created by Cl^-

(C) F-centres, which is cation trapped in cation vacancy created by Na+

(D) interstitial defect caused by external impurity

14. **Assertion :** When 1·0 mol of NaCl is doped with 10^{-3} $SrCl_2$, the number of cationic sites remaining vacant is 10^{-3}.

Reason : Each $SrCl_2$ unit produces two cationic vacancies.

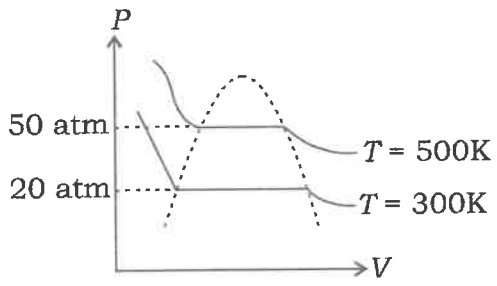
(A) Both **Assertion** and **Reason** are true and **Reason** is a correct explanation of **Assertion**

(B) Both **Assertion** and **Reason** are true but **Reason** is not a correct explanation of **Assertion**

(C) **Assertion** is true but **Reason** is false

(D) **Assertion** is false but **Reason** is true

15. For a real gas, the P–V curve was experimentally plotted and it had the following appearance with respect to liquefaction. Choose the ***correct*** statement.



(A) At T = 500K, P = 40 atm, the state will be liquid

(B) At T = 300K, P = 50 atm, the state will be gas

(C) At T < 300K, P > 20 atm, the state will be gas

(D) At 300K < T < 500K, P > 50 atm, the state will be liquid

16. Joule-Thomson expansion of an ideal gas is an

(A) isothermal process

(B) isobaric process

(C) isoenthalpic process

(D) ideal process

17. Calculate the temperature at which r.m.s. velocity of SO_2 molecules is same as that of O_2 molecules at 27 °C. Molecular weights of oxygen and sulphur dioxide are 32 and 64 respectively.

(A) 327 °C

(B) 227 °C

(C) 127 °C

(D) 307 °C

18. If the slope of Z (compressibility factor) v/s P curve is constant $\left(\text{slope} = \frac{\pi}{492{\cdot}6}\text{atm}^{-1}\right)$ at a particular temperature (300 K) and very high pressure, then calculate diameter of the molecules.

(Given : $N_A = 6{\cdot}02 \times 10^{23}$, $R = 0{\cdot}0821$ atm. lit mol^{-1} K^{-1})

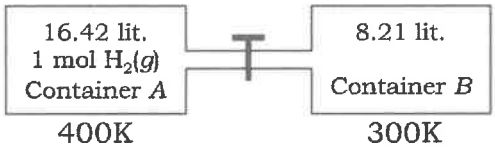
(A) 7·5 Å

(B) 5 Å

(C) 2·5 Å

(D) 1·25 Å

19. A container containing $H_2(g)$ was connected to another empty container as shown in diagram and maintained at given temperature.



The ratio of total number of collisions in container A to container B is

(A) $\frac{3\sqrt{3}}{4}$

(B) $\frac{9}{16}$

(C) $\frac{3\sqrt{3}}{8}$

(D) None of the above

20. Match the following (where U_{rms} = root mean square speed, U_{av} = average speed, U_{mp} = most probable speed) :

List—I	**List—II**
(a) U_{rms}/U_{av}	*(i)* 1·22
(b) U_{av}/U_{mp}	*(ii)* 1·13
(c) U_{rms}/U_{mp}	*(iii)* 1·08

(A) *(a)-(iii), (b)-(ii), (c)-(i)*

(B) *(a)-(iii), (b)-(i), (c)-(ii)*

(C) *(a)-(i), (b)-(ii), (c)-(iii)*

(D) *(a)-(ii), (b)-(iii), (c)-(i)*

21. If the surface of a liquid is plane, then the angle of contact of the liquid with the walls of the container is

(A) acute angle

(B) obtuse angle

(C) 90°

(D) 0°

22. Water rises to height in the capillary tube. If the length of the capillary tube above the surface of the water is made less than height, then

(A) water does not rise at all

(B) water rises up to a point a little below the top and stays there

(C) water rises up to the tip of the capillary tube and then starts overflowing like a fountain

(D) water rises up to the top of the capillary tube and stays there without overflowing

23. Which of the following is ***correct*** regarding Kelvin equation of change in vapor pressure?

(A) As the radius of curvature r increases, the vapor pressure difference decreases

(B) As the radius of curvature r decreases, the vapor pressure difference increases

(C) The equation is applicable only to non-volatile liquids

(D) The equation applies only to ideal solutions

24. A gas $\left(C_{v,m} = \frac{3}{2}R\right)$ behaving ideally was allowed to expand reversible and adiabatically from 1 litre to 32 litre. Its initial temperature was 327 °C. The molar enthalpy change (in J/mol) for the process is

(A) $-1125\ R$

(B) $-675\ R$

(C) $-1575\ R$

(D) None of the above

25. Calculate ΔS for 3 mole of a diatomic ideal gas which is heated and compressed from 298 K and 1 bar to 596 K and 4 bar :

[Given : $C_{v,m}$ (gas) = $\frac{5}{2}R$, ln (2) = 0·70, R = 2 cal K^{-1} mol^{-1}]

(A) $-14{\cdot}7$ cal K^{-1}

(B) $+14{\cdot}7$ cal K^{-1}

(C) $-4{\cdot}9$ cal K^{-1}

(D) $6{\cdot}3$ cal K^{-1}

26. In the fusion of one mole of a solid melting at 27 °C, the entropy change can be represented by which of the following? (latent heat of fusion = 2930 J mol^{-1})

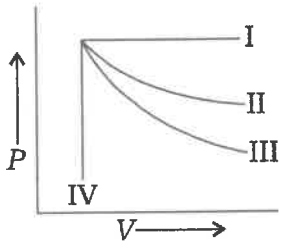
(A) 2930 JK^{-1} mol^{-1}

(B) 16·64 JK^{-1} mol^{-1}

(C) 104·67 JK^{-1} mol^{-1}

(D) 9·77 JK^{-1} mol^{-1}

27.



The plots between P and V which represent isochoric and isobaric processes respectively are

(A) I, II

(B) IV, I

(C) I, IV

(D) II, III

28. One mole of a non-ideal gas undergoes a change of state (2·0 atm, 3·0 L, 95 K) → (4·0 atm, 5·0 L, 245 K) with a change in internal energy, ΔU = 30·0 L atm. The change in enthalpy (ΔH) of the process in L atm is

(A) 40·0

(B) 42·3

(C) 44·0

(D) not defined, because pressure is not constant

29. A Carnot engine is operating between two temperature reservoirs 500 K and 300 K. What is the maximum efficiency of this engine?

(A) 40%

(B) 50%

(C) 60%

(D) 80%

30. Following cell has e.m.f. 0·7995 V. Pt | H_2 (1 atm) | HNO_3 (1 M) || $AgNO_3$ (1 M) | Ag. If we add enough KCl to the Ag cell so that the final Cl^- is 1 M. Now the measured e.m.f. of the cell is 0·222 V. The K_{sp} of AgCl would be

(A) $1 \times 10^{-9·8}$

(B) $1 \times 10^{-19·6}$

(C) 2×10^{-10}

(D) $2·64 \times 10^{-14}$

31. Standard electrode potentials of three metals I, II and III are +0·5 V, –3·0 V and –1·2 V respectively. The order of reducing power of these metals is

(A) II > III > I

(B) I > II > III

(C) III > II > I

(D) I > III > II

32. The hydrogen electrode is dipped in a solution of pH = 3 at 25 °C. The potential of the cell would be (value of 2·303 RT/F is 0·059 V)

(A) 0·177 V

(B) 0·087 V

(C) –0·177 V

(D) 0·059 V

33. The Debye-Hückel limiting law correlates

(A) activity of electrolyte with ionic strength

(B) mean ionic activity coefficient of electrolyte with ionic strength

(C) molality of electrolyte with ionic strength

(D) mean molality of electrolyte with ionic strength

34. Half-wave potential is dependent on

(A) concentration of electroactive species

(B) nature of supporting electrolyte

(C) dissolved oxygen

(D) nature of electroactive species

35. The second law of Thermodynamics implies that

(A) the efficiency of a heat engine is always 100%

(B) it is impossible to construct a perpetual motion machine of the second kind

(C) heat energy is conserved

(D) work can be completely converted into heat

36. In amperometric measurements, what is the function of the counter electrode?

(A) To measure the current

(B) To provide a stable reference potential

(C) To balance the current that flows through the working electrode

(D) To promote the oxidation or reduction of the analyte

37. $\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} C_6H_{12}O_6 + \underset{\text{Glucose}}{C_6H_{12}O_6} \quad \underset{\text{Fructose}}{}$

Hydrolysis of sucrose is proceeded at a certain temperature and, volume of solution is maintained as 1 L. At the beginning, the initial rotation is found 34°, after 30 min the total rotation of the solution is 1 g and after sufficient time, the total rotation is −11°C. After what time the solution becomes optically inactive?

(A) 135 min

(B) 103·7 min

(C) 38·7 min

(D) 45 min

38. For the two gaseous reactions, following data are given :

$A \rightarrow B$; $k_1 = 10^{10} e^{-20000/T}$

$C \rightarrow D$; $k_2 = 10^{12} e^{-24606/T}$

The temperature at which k_1 becomes equal to k_2 is

(A) 400 K

(B) 1000 K

(C) 800 K

(D) 1500 K

39. $A + B \rightarrow C$

The following data were obtained at 30°C.

Experiment	[A] (mol L^{-1})	Rate (mol L^{-1} h^{-1})
I	0·170	0·05
II	0·340	0·10
III	0·680	0·20

The rate constant for the forward reaction is

(A) 0·294 h^{-1}

(B) 0·588 h^{-1}

(C) 0·123 h^{-1}

(D) 0·210 h^{-1}

40. The Lambert-Beer law in photochemistry is primarily concerned with

(A) the relationship between absorption and the concentration of the absorbing species

(B) the relationship between emission intensity and the concentration of the emitting species

(C) the relationship between absorbance and temperature

(D) the relationship between the energy of the photon and the wavelength

41. In the Jablonski diagram, which transition involves the absorption of energy that leads to fluorescence?

(A) Ground state to excited singlet state ($S_0 \rightarrow S_1$)

(B) Excited singlet state to triplet state ($S_1 \rightarrow T_1$)

(C) Excited singlet state to ground state ($S_1 \rightarrow S_0$)

(D) Excited triplet state to ground state ($T_1 \rightarrow S_0$)

42. Which of the following best defines the quantum yield of a photochemical reaction?

(A) The ratio of the number of photons absorbed by a system to the number of molecules that react

(B) The ratio of the number of molecules that undergo a photochemical reaction to the number of photons absorbed

(C) The ratio of energy released to the energy absorbed during a photochemical reaction

(D) The ratio of the total number of photons emitted to the total number of photons absorbed

43. For adsorption of a gas on a solid, the plot of log x/m vs log P is linear with slope equal to (n being a whole number)

(A) k

(B) log k

(C) n

(D) $1/n$

44. Which of the following factors influences the rate of adsorption?

(A) Surface area of the adsorbent

(B) Temperature

(C) Pressure of the adsorbate

(D) All of the above

45. During electro-osmosis of $Fe(OH)_3$ sol

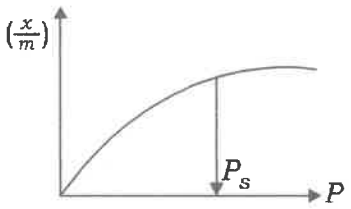
(A) sol particles move towards anode

(B) sol particles move towards cathode

(C) the dispersion medium moves towards anode

(D) the dispersion medium moves towards cathode

46. The Freundlich isotherm is represented by the following curve :



Pick up the ***correct*** statement.

(A) $\left(\frac{x}{m}\right) = kP$ at high pressure

(B) $\left(\frac{x}{m}\right) = kP^0$ at high pressure

(C) $\left(\frac{x}{m}\right) = kP^{1/n}$ at very low pressure

(D) $\left(\frac{x}{m}\right) = k$ at moderate pressure

47. Which of the following assumptions is made in the BET theory of adsorption?

(A) Adsorption is monolayer-only and occurs at specific sites

(B) The adsorption of molecules on the surface does not influence the adsorption of other molecules

(C) Adsorption occurs only on the external surface of the adsorbent

(D) Adsorbed molecules in each layer do not interact with molecules in the other layers

48. Among the electrolytes Na_2SO_4, $CaCl_2$, $Al_2(SO_4)_3$ and NH_4Cl, the most effective coagulating agent for Sb_2S_3 sol is

(A) Na_2SO_4

(B) $CaCl_2$

(C) $Al_2(SO_4)_3$

(D) NH_4Cl

49. Match the catalysts to the ***correct*** processes :

Catalyst	**Process**
(a) $TiCl_3$	*(i)* Wacker process
(b) $PdCl_2$	*(ii)* Ziegler – Natta polymerization
(c) $CuCl_2$	*(iii)* Contact process
(d) V_2O_5	*(iv)* Deacon's process

(A) *(a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)*

(B) *(a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)*

(C) *(a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)*

(D) *(a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)*

50. Which of the following metal ions is associated with the enzyme carbonic anhydrase?

(A) Zinc (Zn)

(B) Copper (Cu)

(C) Manganese (Mn)

(D) Magnesium (Mg)

51. What is the role of copper (Cu) in the enzyme superoxide dismutase (SOD)?

(A) It acts as a structural component

(B) It catalyzes the conversion of superoxide anion to hydrogen peroxide

(C) It binds to DNA and regulates gene expression

(D) It stabilizes ATP during cellular metabolism

52. What is the oxidation state of iron in the iron-sulfur clusters of ferredoxins?

(A) +1

(B) +2

(C) +3

(D) Both +2 and +3

53. Match the metals **Column—I** with the coordination compounds/ enzymes **Column—II** :

Column—I	**Column—II**
Metal	**Coordination compound/ enzyme**
(a) Co	*(i)* Wilkinson's catalyst
(b) Zn	*(ii)* Chlorophyll
(c) Rh	*(iii)* Vitamin B_{12}
(d) Mg	*(iv)* Carbonic anhydrase

(A) *(a)-(i); (b)-(ii); (c)-(iii); (d)-(iv)*

(B) *(a)-(iv); (b)-(iii); (c)-(i); (d)-(ii)*

(C) *(a)-(iii); (b)-(iv); (c)-(i); (d)-(ii)*

(D) *(a)-(ii); (b)-(i); (c)-(iv); (d)-(iii)*

54. Among the following, the colourless ions are

(i) Ti^{4+}

(ii) Cu^{+1}

(iii) Co^{3+}

(iv) Fe^{2+}

(A) *(i)* and *(ii)*

(B) *(i)*, *(ii)* and *(iii)*

(C) *(iii)* and *(iv)*

(D) *(ii)* and *(iii)*

55. When MnO_2 is fused with KOH, a coloured compound is formed. The product and its colour is

(A) K_2MnO_4, green

(B) Mn_2O_3, brown

(C) Mn_2O_4, black

(D) $KMnO_4$, purple

56. The geometries of $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are

(A) both square planar

(B) tetrahedral and square planar respectively

(C) both tetrahedral

(D) square planar and tetrahedral respectively

57. Which of the following complexes are diamagnetic?

$[Pt(NH_3)_4]^{2+}$	$[Co(SCN)_4]^{2-}$	$[Cu(en)_2]^{2+}$	$[HgI_4]^{2-}$
square planar	tetrahedral	square planar	tetrahedral
(i)	*(ii)*	*(iii)*	*(iv)*

(A) *(i)* and *(ii)*

(B) *(ii)* and *(iii)*

(C) *(i)* and *(iv)*

(D) *(iii)* and *(iv)*

58. $Co^{2+}(aq) + SCN^{-}(aq) \rightarrow$ Complex (X)

$Ni^{2+}(aq)$ + Dimethylglyoxide $\xrightarrow{NH_4OH}$ Complex (Y)

The coordination number of cobalt and nickel in complexes (X) and (Y) is four.

The IUPAC names of the complexes (X) and (Y) are respectively -

(A) tetrathiocyanato-S-cobalt (II) and bis (dimethylglyoximate) nickel (II)

(B) tetrathiocyanato-S-cobaltate (II) and bis (dimethylglyoximato) nickel (II)

(C) tetrathiocyanato-S-cobaltate (II) and bis (dimethylglyoximato) nickelate (II)

(D) tetrathiocyanato-S-cobaltate (III) and bis (dimethylglyoximato) nickel (II)

59. Which of the following sets is example of co-ordination isomerism in complexes?

(A) $[Co(NH_3)_6]$ $[Cr(CN)_6]$ and $[Co(CN)_6]$ $[Cr(NH_3)_6]$

(B) $[Cr(H_2O)_5Cl]Cl_2.H_2O$ and $[Cr(H_2O)_4Cl_2]Cl.2H_2O$

(C) $[Co(NH_3)_5Br]SO_3$ and $[Cr(NH_3)_5\ SO_4]Br$

(D) $[Pt(NH_3)_2Cl_2]$ and $[Pt(NH_3)_4]$ $[PtCl_4]$

60. The geometries and magnetic moments of the complexes $[NiCl_4]^{2-}$ and $[PdCl_4]^{2-}$ respectively are

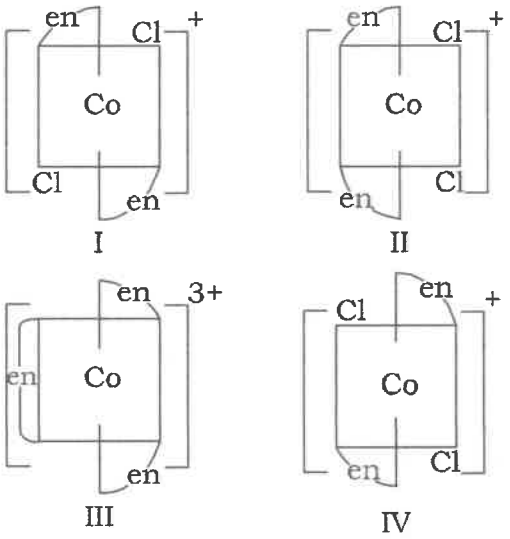
(A) tetrahedral, square planar; 2·83, 0

(B) tetrahedral, tetrahedral; 2·83, 2·83

(C) square planar, tetrahedral; 0, 2·83

(D) square planar, square planar; 0, 0

61. Which of the following ions is/are optically active?



(A) I only

(B) II only

(C) II and III only

(D) IV only

62. Which one of the following is called as Zeise's salt?

(A) $[Pt(NH_3)_4]$ $[Pt\ Cl_4]$

(B) $K[PtCl_3(C_2H_4)]$

(C) $K_4[Fe(CN)_6]$

(D) $[Fe(CO)_5]$

63. Calculate effective atomic number of copper in $[Cu(NH_3)_4]^{+2}$.

(A) 35

(B) 34

(C) 36

(D) 18

64. Which of the following metal ions is most likely to exhibit a Jahn-Teller distortion?

(A) Ti^{3+} (d^1)

(B) Fe^{2+} (d^6)

(C) Mn^{2+} (d^5)

(D) Zn^{2+} (d^{10})

65. In a complex of the form $[Fe(H_2O)_6]^{2+}$, the absorption in the visible region is due to

(A) charge transfer transitions

(B) *d-d* transitions

(C) Ligand to Metal Charge Transfer (LMCT)

(D) Metal to Ligand Charge Transfer (MLCT)

66. Which of the following is ***true*** about charge transfer bands in UV-Visible spectroscopy?

(A) Charge transfer bands usually appear in the infrared region

(B) The energy of charge transfer bands is generally lower than *d-d* transition bands

(C) Charge transfer bands often lead to strong colors

(D) Charge transfer bands never appear in transition metal complexes

67. The ***correct*** order for the wavelength of absorption in the visible region is

(A) $[Ni(NO_2)_6]^{4-} < [Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+}$

(B) $[Ni(NO_2)_6]^{4-} < [Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+}$

(C) $[Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+} < [Ni(NO_2)_6]^{4-}$

(D) $[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+} < [Ni(NO_2)_6]^{4-}$

68. **Assertion :** $[Ti(H_2O)_6]^{3+}$ is coloured while $[Sc(H_2O)_6]^{3+}$ is colourless.

Reason : *d-d* transition is not possible in $[Sc(H_2O)_6]^{3+}$ because no *d*-electron is present.

(A) Both **Assertion** and **Reason** are true and **Reason** is the correct explanation of **Assertion**

(B) Both **Assertion** and **Reason** are true but **Reason** is not the correct explanation of **Assertion**

(C) **Assertion** is true but **Reason** is false

(D) Both **Assertion** and **Reason** are false

69. The ease of liquefaction of noble gases increases in the order :

(A) He < Ne < Ar < Kr < Xe

(B) Xe < Kr <Ne < Ar < He

(C) Kr < Xe < He < Ne < Ar

(D) Ar < Kr < Xe < Ne < He

70. What are the hybrid state and oxidation state of sulphur in Caro's acid?

(A) sp^2, +10

(B) sp^3, +10

(C) sp^2, +6

(D) sp^3, +6

71. The ***correct*** order of acidic strength is

(A) $K_2O < CaO < SiO_2 < CuO < CO_2 < N_2O_5$

(B) $K_2O < CaO < CuO < SiO_2 < CO_2 < N_2O_5$

(C) $CaO < K_2O < SiO_2 < CuO < CO_2 < N_2O_5$

(D) $K_2O < SiO_2 < CaO < CuO < CO_2 < N_2O_5$

72. The thermal stability of the hydrides of group 15 follows which of the following orders?

(A) $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$

(B) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$

(C) $PH_3 > NH_3 > AsH_3 > SbH_3 < BiH_3$

(D) $AsH_3 < PH_3 > SbH_3 > BiH_3 > NH_3$

73. Cl_2 — Cold and dilute NaOH → (A) + NaCl + H_2O; Hot and conc. NaOH → (B) + NaCl + H_2O

Compounds (A) and (B) are

(A) $NaClO_3$, NaClO

(B) $NaOCl_2$, NaOCl

(C) $NaClO_4$, $NaClO_3$

(D) NaOCl, $NaClO_3$

74. A greenish yellow gas reacts with an alkali hydroxide to form a halate which can be used in fireworks and safety matches. The gas and the halate are

(A) Br_2, $KBrO_3$

(B) Cl_2, $KClO_3$

(C) I_2, $NaIO_3$

(D) I_2, KIO_3

75. What are the products formed in the reaction of xenon hexafluoride with silicon dioxide?

(A) $XeSiO_4$ + HF

(B) XeF_2 + SiF_4

(C) $XeOF_4$ + SiF_4

(D) XeO_3 + SiF_2

76. Which one of the following behaves like pseudohalide?

(A) $(CN)_2$

(B) $(SCN)_2$

(C) N_3^-

(D) I_3^-

77. A compound of boron *X* reacts at 200 °C temperature with NH_3 to give another compound *Y* which is called as inorganic benzene. The compound *Y* is a colourless liquid and is highly light sensitive. Its melting point is –57 °C. The compound *X* with excess of NH_3 and at a still higher temperature gives boron nitride $(BN)_n$. The compounds *X* and *Y* are respectively

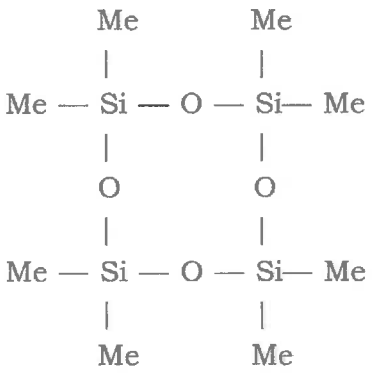
(A) BH_3 and B_2H_6

(B) $NaBH_4$ and C_6H_6

(C) B_2H_6 and $B_3N_3H_6$

(D) B_4C_3 and C_6H_6

78. Given type of silicones are called [P]



[P] is prepared by controlled hydrolysis of [Q]. [P] and [Q] are respectively

(A) linear silicone, CH_3SiCl_3

(B) branched silicone, $(CH_3)_3SiCl$

(C) cyclic silicone, $(CH_3)_2SiCl_2$

(D) cyclic silicone, CH_3SiCl_3

79. In which of the following silicates, three O-atoms are shared per SiO_4 tetrahedral?

(A) Orthosilicate

(B) Pyrosilicate

(C) Cyclic silicate

(D) Sheet silicate

80. Which of the following statements about diborane is ***not true***?

(A) The B atoms in it are sp^3-hybridized

(B) It contains two 3-centre-2-electron bonds

(C) All B — H bond lengths are equal due to resonance

(D) The molecule is non-planar

81. There is no S — S bond in

(A) $S_2O_4^{2-}$

(B) $S_2O_5^{2-}$

(C) $S_2O_3^{2-}$

(D) $S_2O_7^{2-}$

82. Which of the following is a general structural formula for a phosphazene?

(A) $(P = N)_n$

(B) $(P = O)_n$

(C) $(P — N)_n$

(D) $(P = N — O)_n$

83. The lanthanoid contraction is responsible for the fact that

(A) Zr and Y have the same radius

(B) Zr and Nb have similar oxidation state

(C) Zr and Hf have the same radius

(D) Zr and Ce have the same oxidation state

84. The separation of lanthanoids by ion exchange method is based on

(A) sizes of the ions

(B) oxidation states of the ions

(C) the solubility of their nitrates

(D) basicity of hydroxides of lanthanides

85. Which of the following statements is ***not correct***?

(A) $La(OH)_3$ is less basic than $Lu(OH)_3$

(B) In lanthanide series, ionic radius of Ln^{3+} ions decreases

(C) La is actually an element of transition series rather than lanthanide series

(D) Atomic radii of Zr and Hf are same because of lanthanide contraction

86. The lattice enthalpy and hydration enthalpy of four compounds are given below :

Compound	Lattice enthalpy (in kJ mol^{-1})	Hydration enthalpy (in kJ mol^{-1})
P	+780	–920
Q	+1012	–812
R	+828	–878
S	+632	–600

The pair of compounds which is soluble in water is

(A) *P* and *Q*

(B) *Q* and *R*

(C) *R* and *S*

(D) *P* and *R*

87. The data for the reaction, $A + B \rightarrow C$

Ex	$[A]_0$	$[B]_0$	Initial rate
1	0.012	0.035	0.10
2	0.024	0.070	0.80
3	0.024	0.035	0.10
4	0.012	0.070	0.80

The rate law corresponds to the above data is

(A) rate = $k[B]^3$

(B) rate = $k[B]^4$

(C) rate = $k[A][B]^3$

(D) rate = $k[A]^2[B]^2$

88. The structure of $[XeF_8]^{2-}$ is

(A) cubic

(B) hexagonal bipyramid

(C) square antiprism

(D) octagonal

89. The number of vibrational mode(s) of a carbon dioxide molecule that can be detected using infrared spectroscopy is

(A) 1

(B) 2

(C) 3

(D) 4

90. The complementary strand for the following single strand of DNA is

$5' \leftarrow A - T - G - C - T \rightarrow 3'$

(A) $3' \leftarrow T - A - C - G - A \rightarrow 5'$

(B) $3' \leftarrow A - T - G - C - T \rightarrow 5'$

(C) $5' \leftarrow T - A - C - G - A \rightarrow 3'$

(D) $5' \leftarrow A - A - C - G - T \rightarrow 3'$

91. In the structure of $B_4O_5(OH)_4^{-2}$

(A) all four B atoms are trigonal planar

(B) one B atom is tetrahedral and the other three are trigonal planar

(C) three B atoms are tetrahedral and one is trigonal planar

(D) two B atoms are tetrahedral and the other two are trigonal planar

92. Hydrolysis of $(CH_3)_2SiCl_2$ and CH_3SiCl_3 leads to

(A) linear chain and cross-linked silicones respectively

(B) cross-linked and linear chain silicones respectively

(C) linear chain silicones only

(D) cross-linked silicones only

93. The oxide that has the inverse spinel structure is

(A) $FeCr_2O_4$

(B) $MnCr_2O_4$

(C) $CoAl_2O_4$

(D) Fe_2CoO_4

94. The minimum concentration of silver ions that is required to start the precipitation of Ag_2S ($K_{sp} = 1 \times 10^{-51}$) in a 0·1 M solution of S^{2-} is

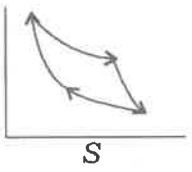
(A) 1×10^{-49} M

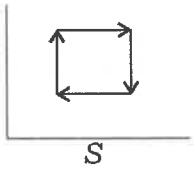
(B) 1×10^{-50} M

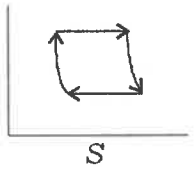
(C) 1×10^{-26} M

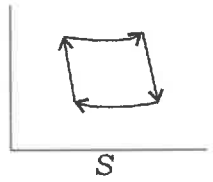
(D) 1×10^{-25} M

95. For an ideal gas undergoing reversible Carnot cycle, the plot of enthalpy (H) vs. entropy (S) is

(A) 

(B) 

(C) 

(D) 

96. Ionisation energy of hydrogen atom in ground state is 13·6 eV. The energy released (in eV) for third member of Balmer series is

(A) 13·056

(B) 2·856

(C) 0·967

(D) 0·306

97. The predicted geometry of TeF_4 by VSEPR theory is

(A) octahedral

(B) square planar

(C) tetrahedral

(D) trigonal bipyramidal

98. An aqueous solution of haemoglobin has a molar absorptivity value of 18600 L mol^{-1} cm^{-1} for an absorbance value of 0·1 at 540 nm (Given : cell thickness = 1 cm). The concentration (in μm) of the haemoglobin solution is

(A) 0·537

(B) 5·37

(C) 53·7

(D) 537·0

99. The electronic transitions responsible for the colour of $K_2Cr_2O_7$ and porphine in their solid state respectively are

(A) $d \rightarrow d$; $\pi \rightarrow \pi^*$

(B) $M \rightarrow L$ charge transfer; $\pi \rightarrow \pi^*$

(C) $L \rightarrow M$ charge transfer; $\pi \rightarrow \pi^*$

(D) $L \rightarrow M$ charge transfer; $d \rightarrow d$

100. The ***correct*** order of M — C (M = Ti, V, Cr and Mn) bond stretching frequency is

(Given : atomic number of Ti = 22, V = 23, Cr = 24 and Mn = 25)

(A) $[V(CO)_6]^- < Cr(CO)_6 < [Mn(CO)_6]^+ < [Ti(CO)_6]^{2-}$

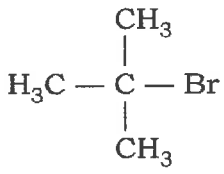
(B) $[Ti(CO)_6]^{2-} < [V(CO)_6]^- < Cr(CO)_6 < [Mn(CO)_6]^+$

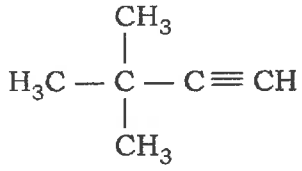
(C) $[Mn(CO)_6]^+ < Cr(CO)_6 < [V(CO)_6]^- < [Ti(CO)_6]^{2-}$

(D) $[Mn(CO)_6]^+ < [V(CO)_6]^- < Cr(CO)_6 < [Ti(CO)_6]^{2-}$

101. Outline the best synthesis of 4,4-dimethyl-2-pentyne using $NaNH_2$ in liquid NH_3 and _____.

(i) $CH_3 \equiv CH$

(ii) 

(iii) 

(iv) CH_3I

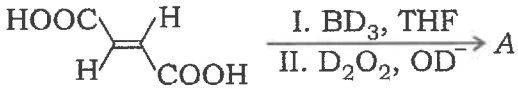
(v) $CH_3 - C \equiv CBr$

(A) *(i)* + *(ii)*

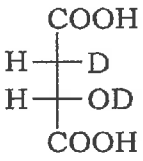
(B) *(iii)* + *(v)*

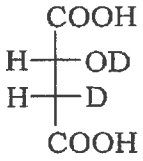
(C) *(iii)* + *(iv)*

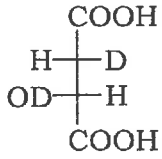
(D) *(ii)* + *(v)*

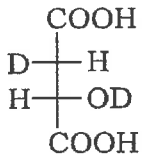
102. 

The final product *A* is

(A) 

(B) 

(C) 

(D) 

103. The yield of alkyl bromide obtained as a result of heating the dry silver salt of carboxylic acid with bromine, what will be the order of formation w.r.t. alkyl bromide?

(A) 1° > 3° > 2° bromides

(B) 1° > 2° > 3° bromides

(C) 3° > 2° > 1° bromides

(D) 3° > 1° > 2° bromides

104. $CH_3 - C \equiv C - CH_2 - CH_3$

$$\xrightarrow{Br_2(1\ eq),\ CCl_4} X \xrightarrow{Br_2,\ h\nu} Y + Z$$

There are two isomeric forms *Y* and *Z* for the product, *Y* and *Z* are

(A) constitutional isomers

(B) conformational isomers

(C) enantiomers

(D) diastereomers

105. In reaction

 $+ CH_3Cl \xrightarrow[CS_2]{\text{Anhyd. } AlCl_3}$.

The major product is

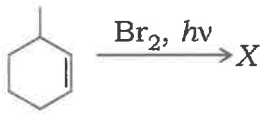
(A) 2-methoxy toluene

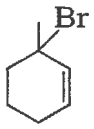
(B) 4-methoxy toluene

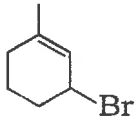
(C) 3-methoxy toluene

(D) None of the above

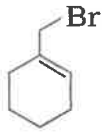
106. The thermodynamic product X is

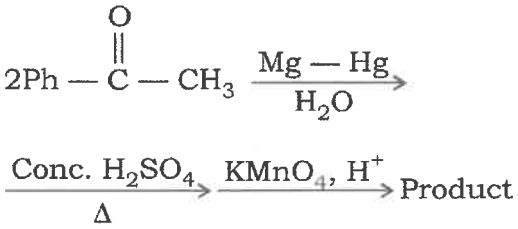


(A) 

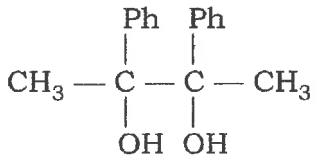
(B) 

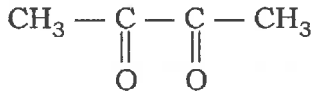
(C) 

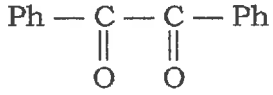
(D) 

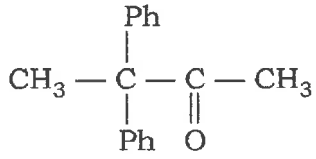
107. 

The final product is

(A) 

(B) 

(C) 

(D) 

108. Phenol condenses with formaldehyde to form

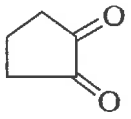
(A) bakelite

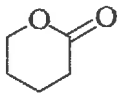
(B) asbestos

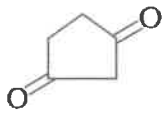
(C) polyacrylaldehyde

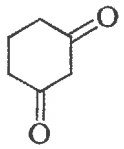
(D) polyester

109. Cyclopentanone on reaction with *m*-CPBA gives

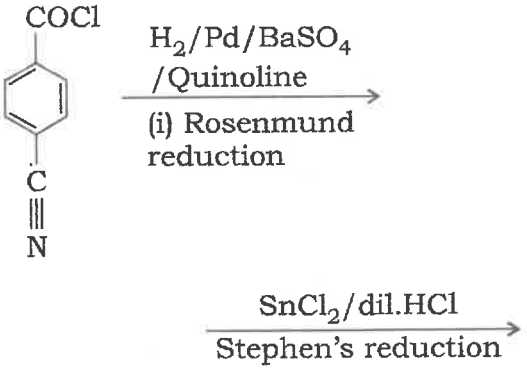
(A) 

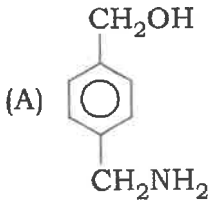
(B) 

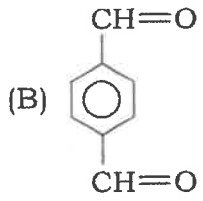
(C) 

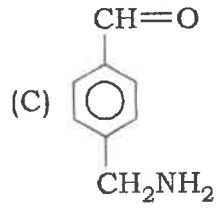
(D) 

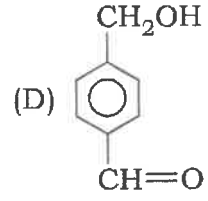
110. The product of the following reaction is



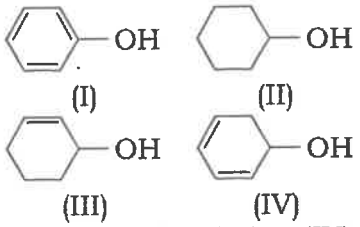
(A) 

(B) 

(C) 

(D) 

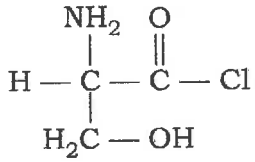
111. Among the given compounds, the ***correct*** dehydration order is

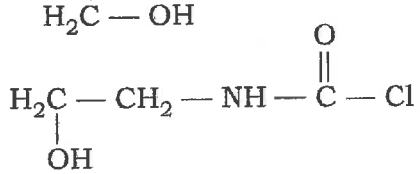


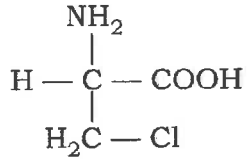
(A) (I) > (II) > (III) > (IV)
(B) (II) > (III) > (IV) > (I)
(C) (I) > (III) > (IV) > (II)
(D) (II) > (I) > (III) > (IV)

112. The main point of difference between DNA and RNA is
(A) presence of thymine in DNA and RNA
(B) presence of deoxyribose and thymine in DNA, ribose and uracil in RNA
(C) presence of ribose and thymine in DNA, deoxyribose and uracil in RNA
(D) presence of deoxyribose in DNA and ribose in RNA

113. An α-amino acid I has molecular formula $C_3H_7NO_3$. I on treatment with methanol in presence of HCl yields II $[C_4H_{10}NO_3Cl]$. II on further treatment with PCl_5 yields III $[C_4H_9NO_2Cl_2]$ which on acidic hydrolysis yields IV $[C_3H_6NO_2Cl]$. IV on reduction with Na(Hg) in dilute acidic medium yields alanine. Compound IV is

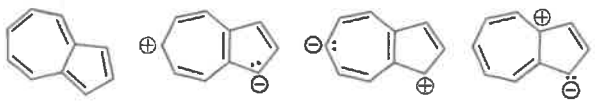
(A) 

(B) 

(C) 

(D) (A) and (B) both are possible

114. The most stable and the least stable resonating structures are respectively



I II III IV

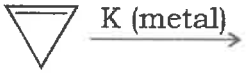
(A) I and IV

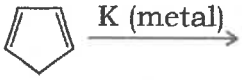
(B) I and III

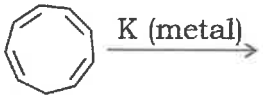
(C) II and III

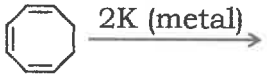
(D) III and II

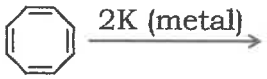
115. In which of the following reactions, H_2 gas is ***not*** liberated?

(I) 

(II) 

(III) 

(IV) 

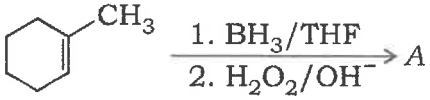
(V) 

(A) (I), (III)

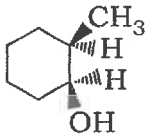
(B) (II), (III), (IV)

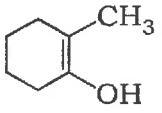
(C) (I), (V)

(D) (V) only

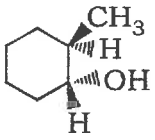
116. 

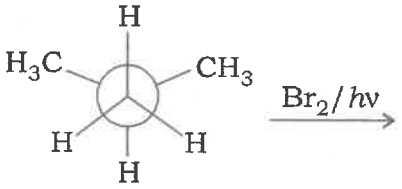
Product *A* is

(A) 

(B) 

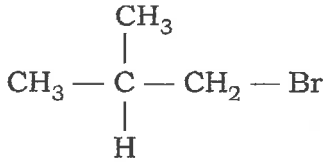
(C) 

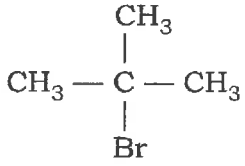
(D) 

117. 

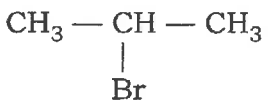
Product (major)

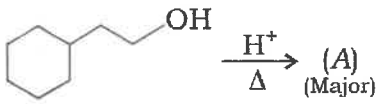
Identify the major product.

(A) 

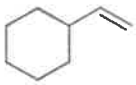
(B) 

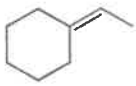
(C) $CH_3 - CH_2 - CH_2 - Br$

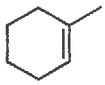
(D) 

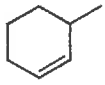
118. 

Major product (*A*) is

(A) 

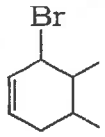
(B) 

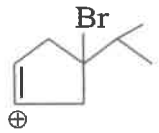
(C) 

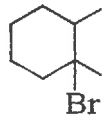
(D) 

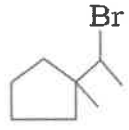
119. 

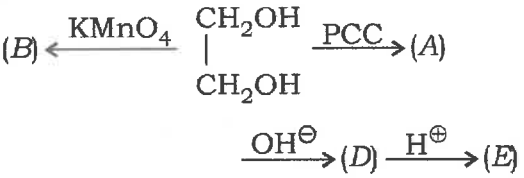
Major product (*A*) is

(A) 

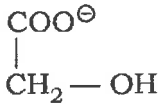
(B) 

(C) 

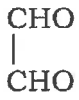
(D) 

120. 

Select the ***incorrect*** statement.

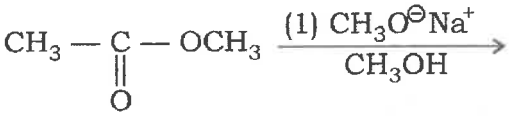
(A) (*D*) is 

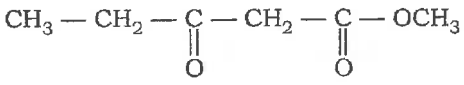
(B) (*B*) and (*E*) are same compounds

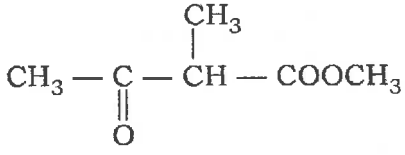
(C) (*A*) is 

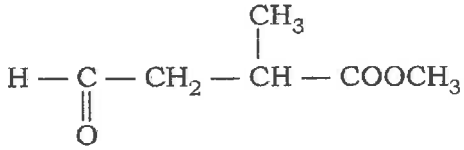
(D) (*E*) on oxidation gives (*B*)

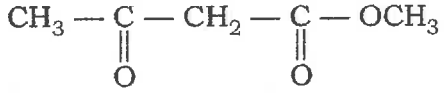
121. In the given reaction, the product is

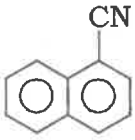


(A) 

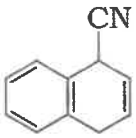
(B) 

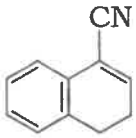
(C) 

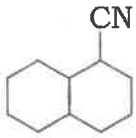
(D) 

122.  $\xrightarrow{Na/NH_3(l)}$ Product

The product can be

(A) 

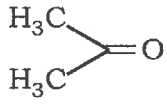
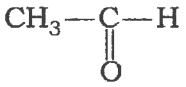
(B) 

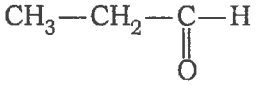
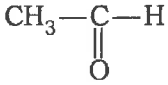
(C) 

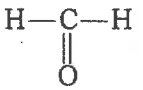
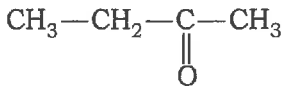
(D) None of the above

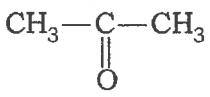
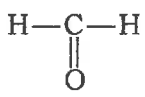
123.  $\xrightarrow[H_2O_2]{OSO_4}$ $A \xrightarrow{HiO_4} B + C$

Products B and C are respectively

(A)  and 

(B)  and 

(C)  and 

(D)  and 

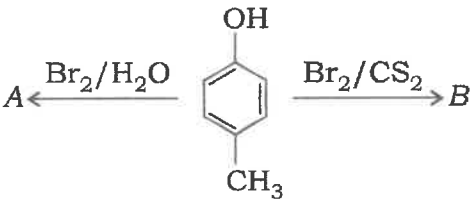
124. Which of the following carbocations will be most stabilized by resonance?

(A) Benzyl carbocation

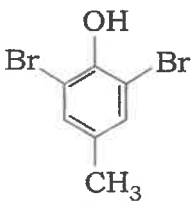
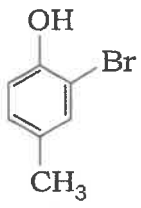
(B) Tertiary carbocation

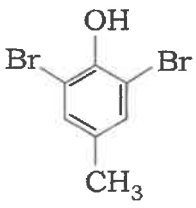
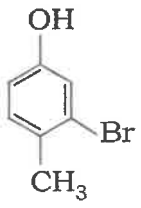
(C) Allyl carbocation

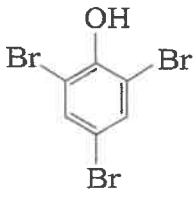
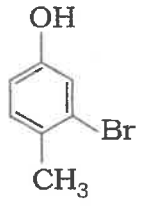
(D) Methyl carbocation

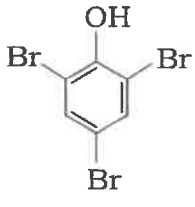
125. 

Predominant A and B respectively are

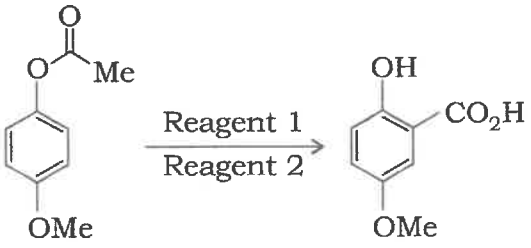
(A)  and 

(B)  and 

(C)  and 

(D)  and 

126. In the following transformation



reagents 1 and 2 are

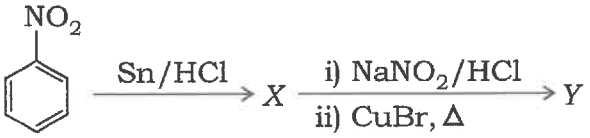
(A) H_2SO_4; alkaline $KMnO_4$

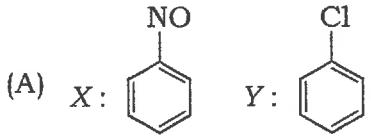
(B) $AlCl_3$; I_2/NaOH

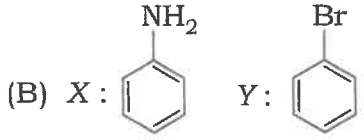
(C) H_3PO_4; $CHCl_3$/KOH

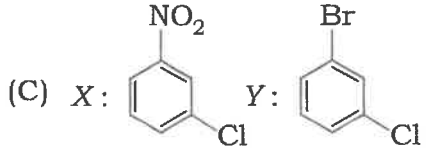
(D) KOH; $CHCl_3$/KOH

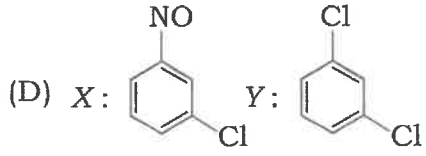
127. The products *X* and *Y* in the following reaction sequence are



(A) 

(B) 

(C) 

(D) 

128. In a [4+2] cycloaddition reaction (Diels-Alder reaction), which orbitals are involved in the reaction?

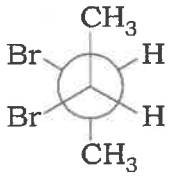
(A) Only *p* orbitals

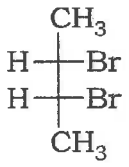
(B) sp^3 hybridized orbitals

(C) sp^2 hybridized orbitals

(D) *p* and sp^2 hybridized orbitals

129. Identify the relation between the molecules given in Newman and Fischer projections.





(A) Identical

(B) Enantiomers

(C) Diastereomers

(D) Conformers

130. The *R*/*S* designation for the stereoisomer of 1,3-dibromo-2-methylbutane is

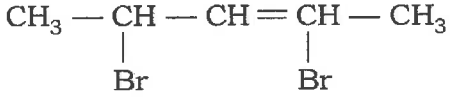
(A) 2*R*, 3*R*

(B) 2*R*, 3*S*

(C) 2*S*, 3*R*

(D) 2*S*, 3*S*

131. Total number of isomers for



is

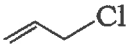
(A) 4

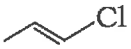
(B) 6

(C) 8

(D) 2

132. The rate of hydrolysis (S_N1) reaction for the given molecules is

(i) 

(ii) 

(iii) Ph—CH_2—Cl

(iv) CH_3—CH_2—CH_2—Cl

(A) *(i)* > *(ii)* > *(iii)* > *(iv)*

(B) *(iii)* > *(i)* > *(ii)* > *(iv)*

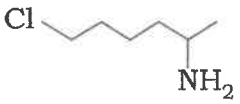
(C) *(iii)* > *(i)* > *(iv)* > *(ii)*

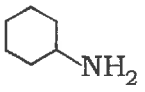
(D) *(ii)* > *(iii)* > *(iv)* > *(i)*

133. 6-chlorohexan-2-ol $\xrightarrow[\Delta]{NaNH_2}$

Major product is

(A) 

(B) 

(C) 

(D) 

134. Match ***List—I*** with ***List—II*** :

List—I ***(Polymer)***	***List—II*** ***(Polymerizing Units)***
(a) Bakelite	*(p)* Butadiene and styrene
(b) Dacron	*(q)* Phenol and methanal
(c) Nylon-66	*(r)* 1,2-dihydroxyethane and dimethyl terephthalate
(d) Buna-S	*(s)* 1,6-hexanedioic acid and 1,6-diamino hexane

Choose the ***correct*** answer from the options given below :

(A) *(a)* - *(s)* ; *(b)* - *(r)* ; *(c)* - *(q)* ; *(d)* - *(p)*

(B) *(a)* - *(p)* ; *(b)* - *(s)* ; *(c)* - *(r)* ; *(d)* - *(q)*

(C) *(a)* - *(q)* ; *(b)* - *(r)* ; *(c)* - *(s)* ; *(d)* - *(p)*

(D) *(a)* - *(q)* ; *(b)* - *(p)* ; *(c)* - *(r)* ; *(d)* - *(s)*

135. $PhCHO + (CH_3CO)_2O \xrightarrow[\Delta]{(1)\ CH_3COONa}$

$A \xrightarrow{HBr} B$

The product *B* is

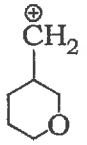
(A) $PhCH{=}CHCH_2Br$

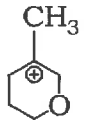
(B) $PhCH(Br) - CH_2 - COOH$

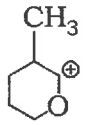
(C) $PhCH_2\ CH(Br)\ COOH$

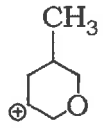
(D) $PhCH = CH—COBr$

136. Identify the most stable carbocation among the following.

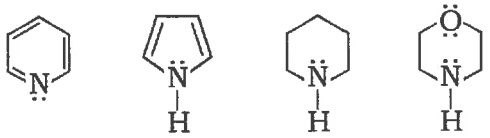
(A) 

(B) 

(C) 

(D) 

137. Arrange the following compounds in the increasing order of basicity.



(I) (II) (III) (IV)

(A) III > I > IV > II

(B) III > IV > I > II

(C) II > I > IV > III

(D) I > II > III > IV

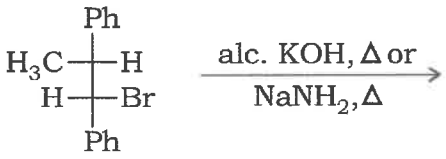
138. Which of the following has maximum boiling point?

(A) $CH_3CH_2CH_2Cl$

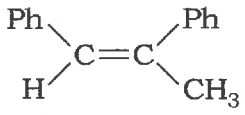
(B) $CH_3CH_2CH_2OH$

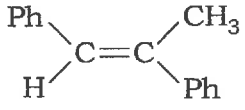
(C) $CH_3\underset{\underset{OH}{|}}{C}HCH_3$

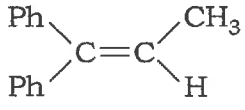
(D) $\underset{\underset{OH}{|}}{CH_2}-CH_2-CH_2-\underset{\underset{OH}{|}}{CH_2}$

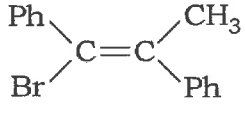
139. 

Major product is

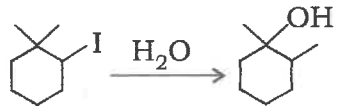
(A) 

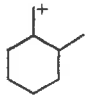
(B) 

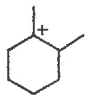
(C) 

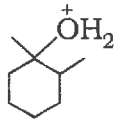
(D) 

140. Which of the following is ***not*** expected to be intermediate of the following reaction?

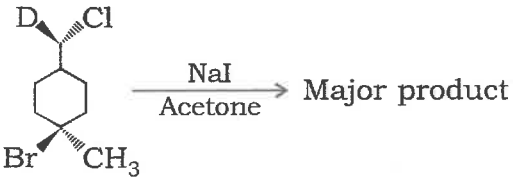


(A) 

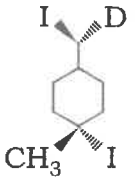
(B) 

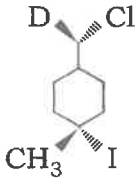
(C) 

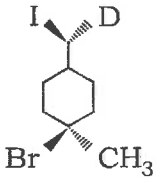
(D) 

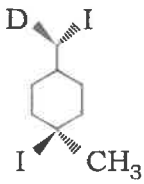
141. 

Major product is

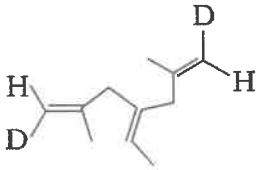
(A) 

(B) 

(C) 

(D) 

142. Number of geometrical isomers possible for the given structure is



(A) 2

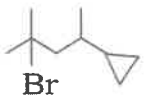
(B) 3

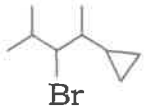
(C) 4

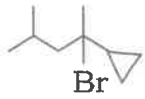
(D) 5

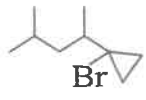
143. 

Product is

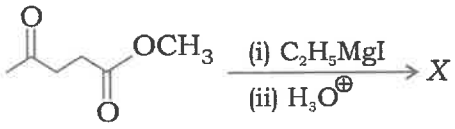
(A) 

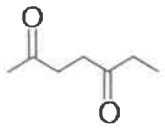
(B) 

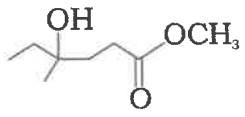
(C) 

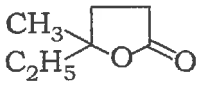
(D) 

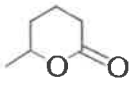
144. Give the structure of the compound *X* formed in the following reaction :



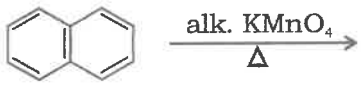
(A) 

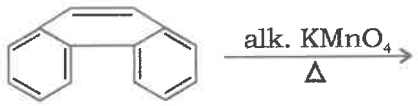
(B) 

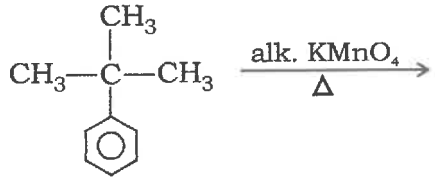
(C) 

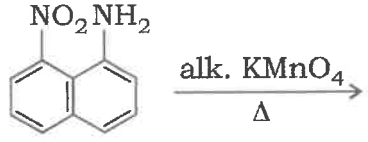
(D) 

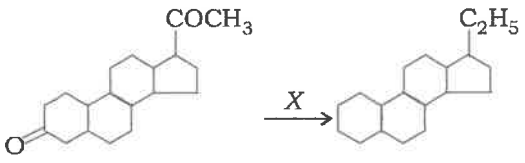
145. Which of the following oxidation reactions is ***not*** possible?

(A) 

(B) 

(C) 

(D) 

146. 

X can be

(A) $NH_2—NH_2/KOH$

(B) Zn—Hg/HCl

(C) Red P + HI

(D) All of the above

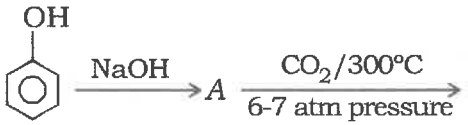
147. In which reaction, ***correct*** product is given?

(A) $CH_3—C\equiv N \xrightarrow{DIBAL-H} CH_3—CH_2—NH_2$

(B) $CH_3—CH_2—NO_2 \xrightarrow{LiAlH_4} CH_3—CH_3$

(C) $Ph—CH=O \xrightarrow[KOH,\Delta]{NH_2—NH_2} Ph—CH_3$

(D) $CH_3—C\equiv C—CH_3 \xrightarrow[NH_3,(l)]{Na} cis\text{-but-2-ene}$

148. 

$$B \xrightarrow{H_3O^{\oplus}} C \xrightarrow{Ac_2O} D$$

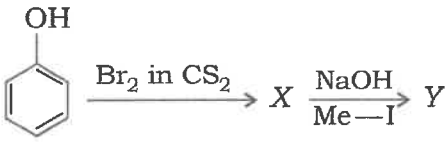
D is

(A) Aspirin

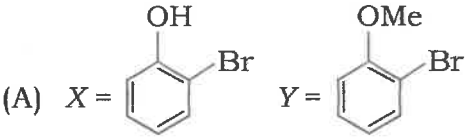
(B) Valine

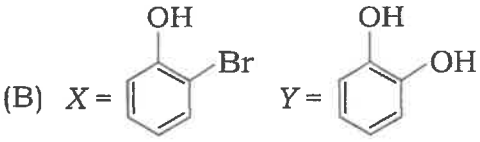
(C) Cumene

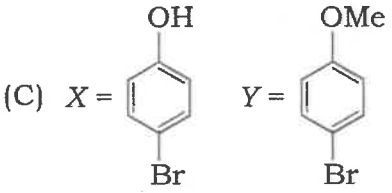
(D) Salicylic acid

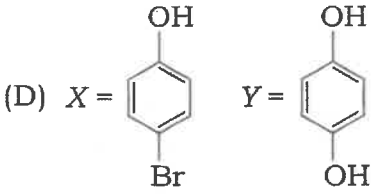
149. 

In the above sequence of reactions, the major products *X* and *Y* are

(A) 

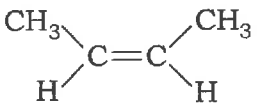
(B) 

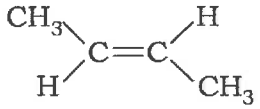
(C) 

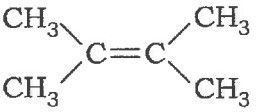
(D) 

150. The reactivity order towards hydrogenation of the following compounds is

(I) $CH_3—C\equiv C—CH_3$

(II) 

(III) 

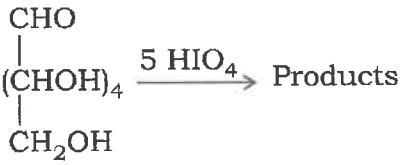
(IV) 

(A) (I) > (II) > (III) > (IV)

(B) (II) > (III) > (IV) > (I)

(C) (III) > (IV) > (II) > (I)

(D) (IV) > (III) > (II) > (I)

151. 

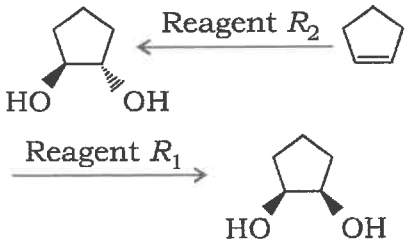
Products are

(A) 5HCOOH, HCHO

(B) 5HCHO, HCOOH

(C) 4HCOOH, 2HCHO

(D) 3HCOOH, 3HCHO

152. 

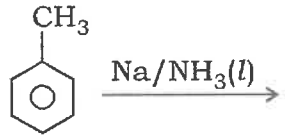
R_1 and R_2 are

(A) cold alkaline $KMnO_4$, OsO_4/ H_2O_2

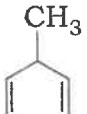
(B) cold alkaline $KMnO_4$, HCO_3H and H_3O^+

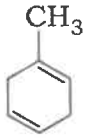
(C) cold alkaline $KMnO_4$, $C_6H_5CO_3H$

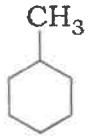
(D) $C_6H_5CO_3H$, HCO_3H

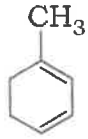
153. 

The product can be

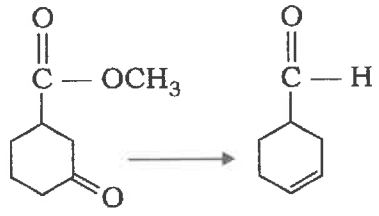
(A) 

(B) 

(C) 

(D) 

154. Give ***correct*** sequence of reagents for the following conversion.



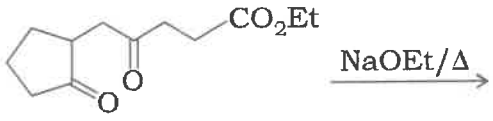
(A) DIBAL — H, $NaBH_4$, $H_3O^{\oplus}/\Delta$

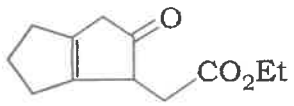
(B) $H_3O^{\oplus}/\Delta$, $NaBH_4$, DIBAL — H

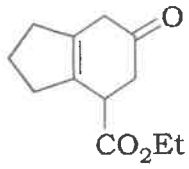
(C) $NaBH_4$, DIBAL — H, $H_3O^{\oplus}/\Delta$

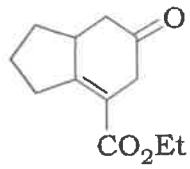
(D) DIBAL — H, $H_3O^{\oplus}/\Delta$, $NaBH_4$

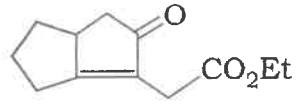
155. The major product obtained in the following reaction is



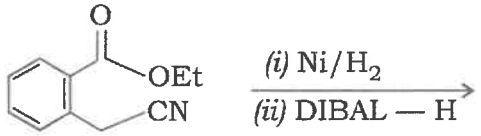
(A) 

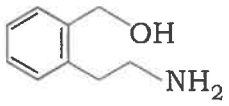
(B) 

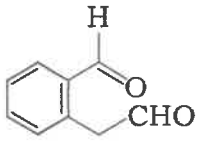
(C) 

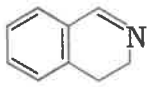
(D) 

156. The major product of the following reaction is



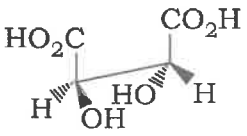
(A) 

(B) 

(C) 

(D) 

157. The absolute configuration of



is

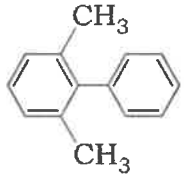
(A) *R*, *R*

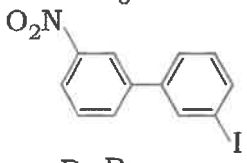
(B) *R*, *S*

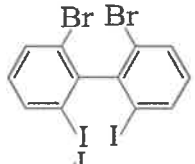
(C) *S*, *R*

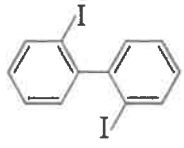
(D) *S*, *S*

158. Which of the following biphenyls is optically active?

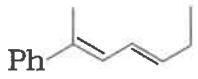
(A) 

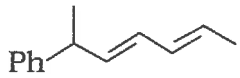
(B) 

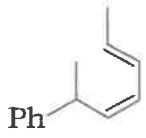
(C) 

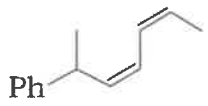
(D) 

159. The major product of the following reaction is

(A) 

(B) 

(C) 

(D) 

160. Which of the following ionization techniques is most commonly used for large biomolecules like proteins and nucleic acids?

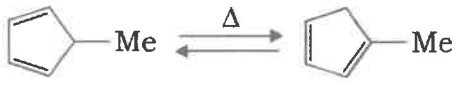
(A) Electron Impact (EI)

(B) Matrix-Assisted Laser Desorption/Ionization (MALDI)

(C) Chemical Ionization (CI)

(D) Electrospray Ionization (ESI)

161. The given reaction is an example of



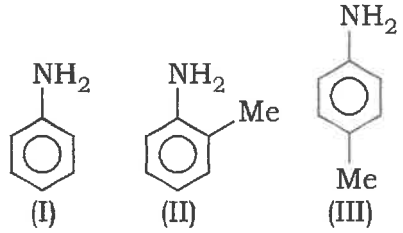
(A) 1,3-sigmatropic shift

(B) 1,3-methyl shift

(C) 1,5-sigmatropic shift

(D) 1,5-methyl shift

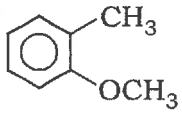
162. Write the ***correct*** order of basic strength of the following compounds.

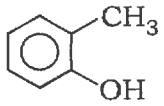


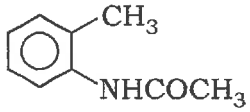
(I) (II) (III)

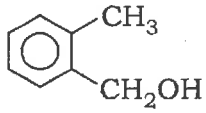
(A) (I) > (II) > (III)
(B) (III) > (II) > (I)
(C) (III) > (I) > (II)
(D) (II) > (III) > (I)

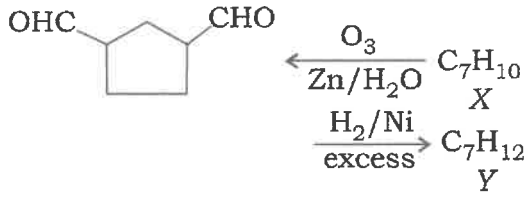
163. Which one of the following is most reactive towards electrophilic reagent?

(A) 

(B) 

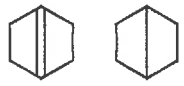
(C) 

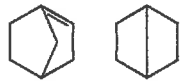
(D) 

164. 

The structures of *X* and *Y* are

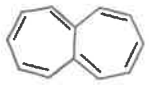
(A) 

(B) 

(C) 

(D) 

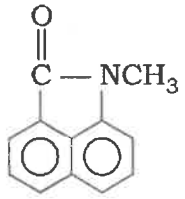
165. Identify the aromatic compound.

(A) 

(B) 

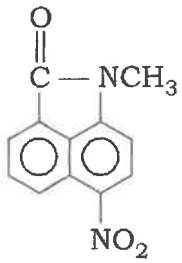
(C) 

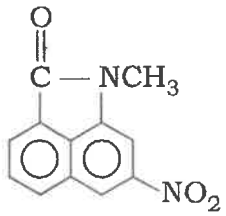
(D) 

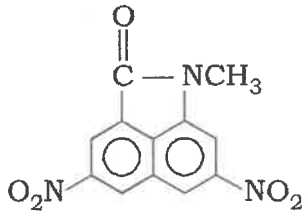
166. 

conc. HNO_3/H_2SO_4 →

Product is

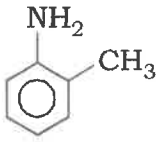
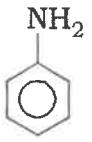
(A) 

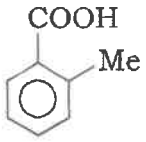
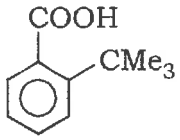
(B) 

(C) 

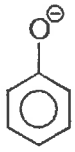
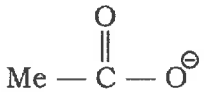
(D) None of the above

167. Select the ***correct*** statement from the following.

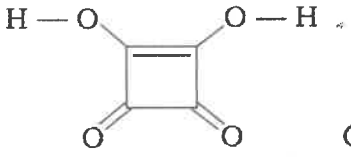
(A)  is more basic than 

(B)  is more acidic than 

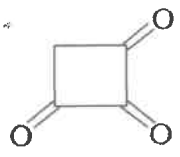
(C) $HC \equiv CH$ is more acidic than NH_3

(D)  is more stable than 

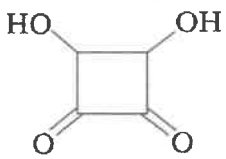
168. The ***correct*** pK_a order of the following acids is



I



II



III

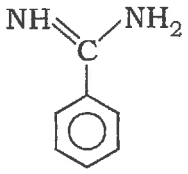
(A) I > II > III

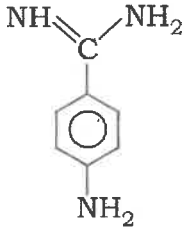
(B) I > III > II

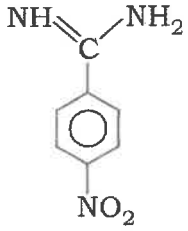
(C) III > II > I

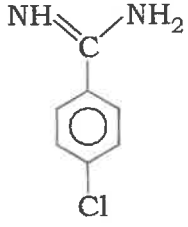
(D) III > I > II

169. Select the decreasing order of relative basic strength of the following species.

(I) 

(II) 

(III) 

(IV) 

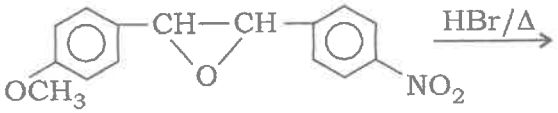
(A) (II) > (IV) > (I) > (III)

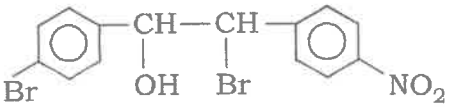
(B) (III) > (I) > (IV) > (II)

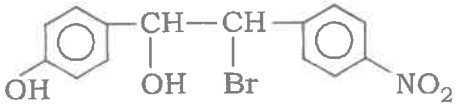
(C) (III) > (IV) > (I) > (II)

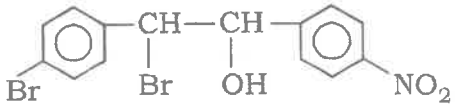
(D) (II) > (I) > (IV) > (III)

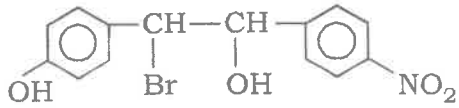
170. Find the product of the given reaction.



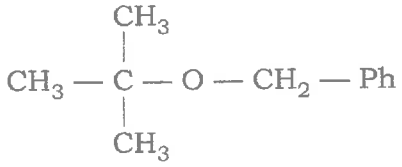
(A) 

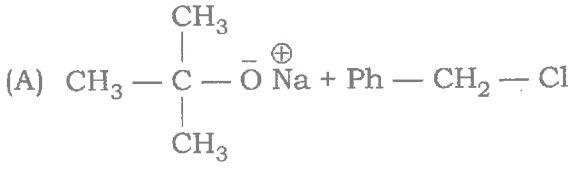
(B) 

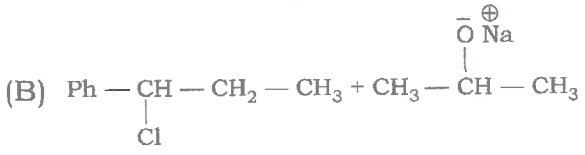
(C) 

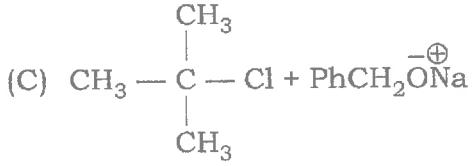
(D) 

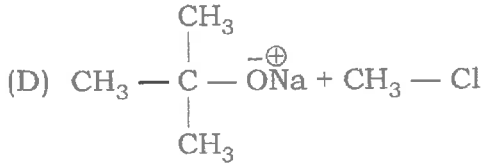
171. What are the suitable reactants for the following ether synthesis?

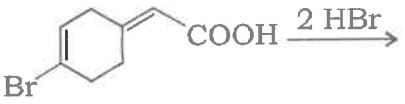


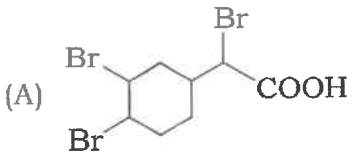
(A) 

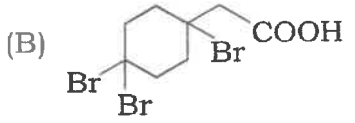
(B) 

(C) 

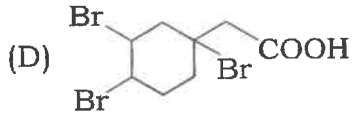
(D) 

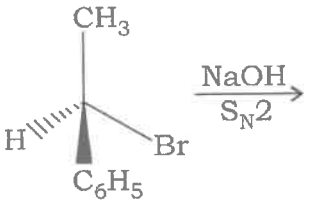
172. 

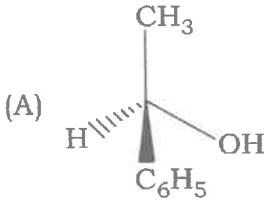
(A) 

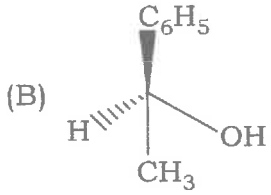
(B) 

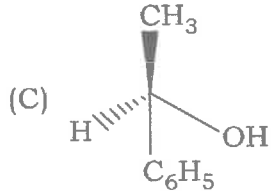
(C) 

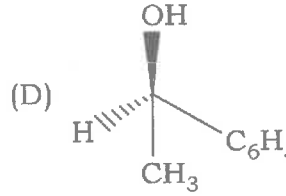
(D) 

173. 

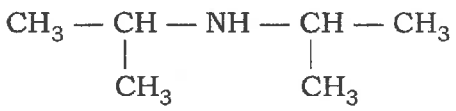
(A) 

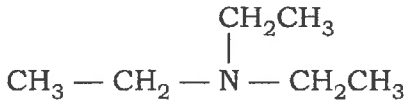
(B) 

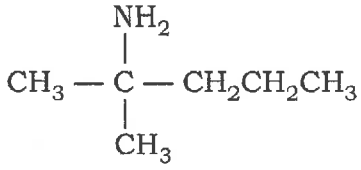
(C) 

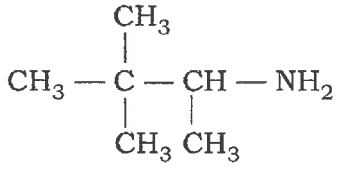
(D) 

174. The amine that reacts with Hinsberg's reagent to give an alkali insoluble product is

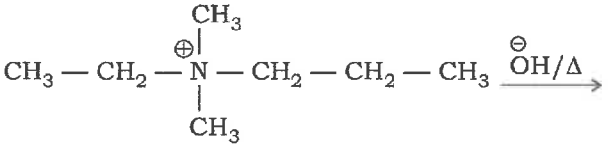
(A) 

(B) 

(C) 

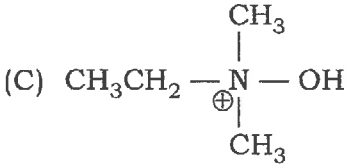
(D) 

175. Identify the major product in the following reaction :



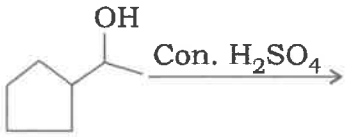
(A) $CH_3 - CH = CH_2$

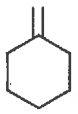
(B) $CH_2 = CH_2$

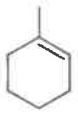
(C) 

(D) CH_3OH

176. Major product of the following reaction is



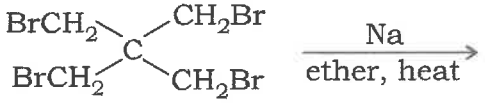
(A) 

(B) 

(C) 

(D) 

177. The product formed in the reaction



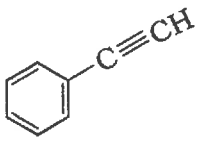
is

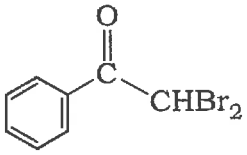
(A) $(BrCH_2)_3CCH_2CH_2C(CH_2Br)_3$

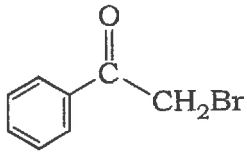
(B) 

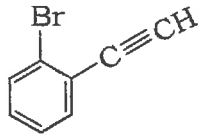
(C) 

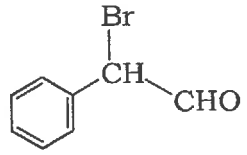
(D) 

178.  HOBr (excess) $\longrightarrow$

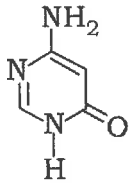
(A) 

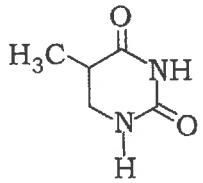
(B) 

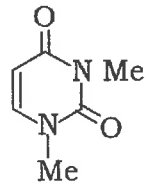
(C) 

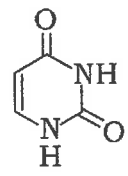
(D) 

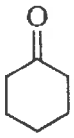
179. Among the following compounds, which one is found in RNA?

(A) 

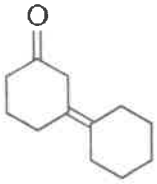
(B) 

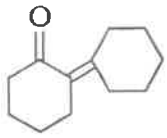
(C) 

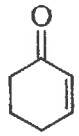
(D) 

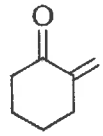
180.  $\xrightarrow{\ominus OH/\Delta}$

Product is

(A) 

(B) 

(C) 

(D) 

181. Which of the following on heating with ammonia gives urotropine?

(A) Formaldehyde

(B) Acetaldehyde

(C) Acetone

(D) Benzaldehyde

182. The acid *D* obtained through the following sequence of reactions is

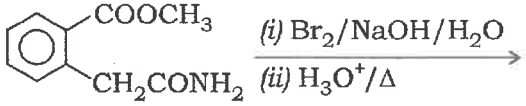
$$C_2H_5Br \xrightarrow{\text{Alc. KOH}} A \xrightarrow[CCl_4]{Br_2} B \xrightarrow[\text{(excess)}]{KCN} C \xrightarrow{H_3O^+} D$$

(A) succinic acid

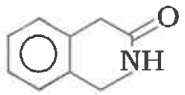
(B) malonic acid

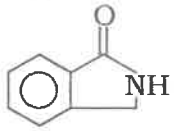
(C) maleic acid

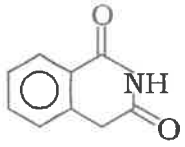
(D) oxalic acid

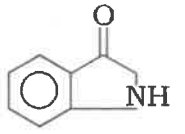
183. 

The major product obtained is

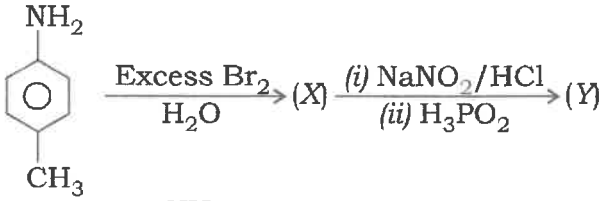
(A) 

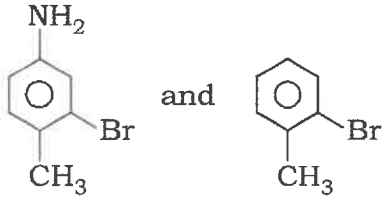
(B) 

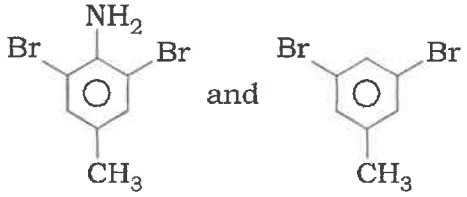
(C) 

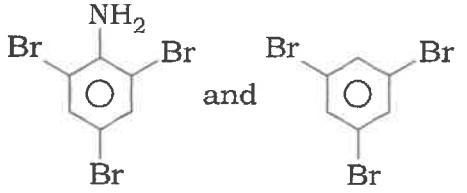
(D) 

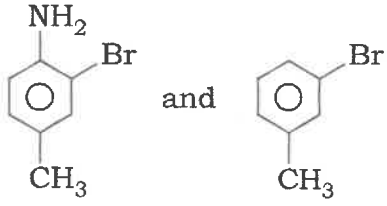
184. In the following reaction sequence, the compounds (*X*) and (*Y*) respectively are

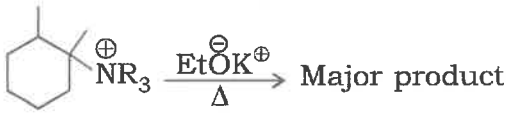


(A) 

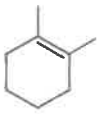
(B) 

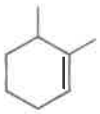
(C) 

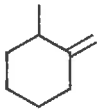
(D) 

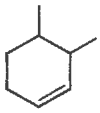
185. 

Major product is

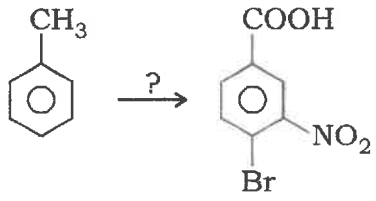
(A) 

(B) 

(C) 

(D) 

186. What are the suitable reagents for the following conversion?



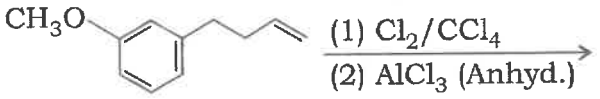
(A) $Br_2/FeBr_3$, $KMnO_4$, HNO_3/H_2SO_4

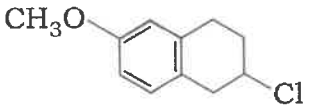
(B) $KMnO_4$, $Br_2/FeBr_3$, HNO_3

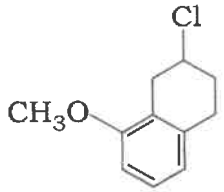
(C) HNO_3, $Br_2/FeBr_3$, $KMnO_4$

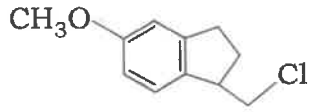
(D) HNO_3, $KMnO_4$, $Br_2/FeBr_3$

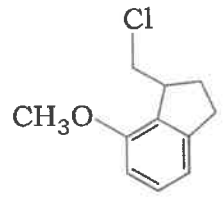
187. The major product of the following reaction is



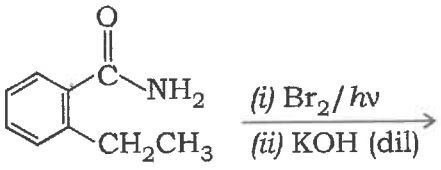
(A) 

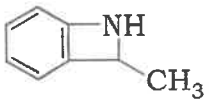
(B) 

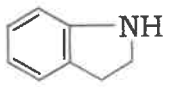
(C) 

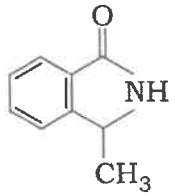
(D) 

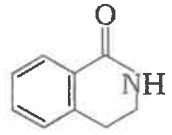
188. The major product of the following reaction is

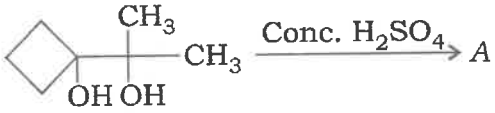


(A) 

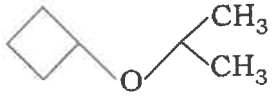
(B) 

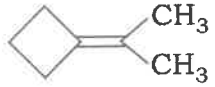
(C) 

(D) 

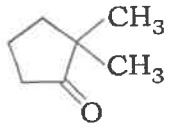
189. 

The product *A* is

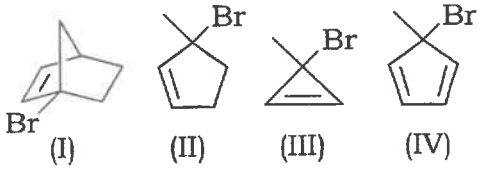
(A) 

(B) 

(C) 

(D) 

190. The ***correct*** rate of solvolysis of the following is



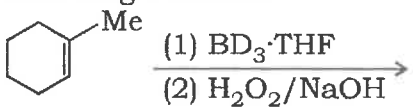
(A) (I) > (II) > (III) > (IV)

(B) (III) > (I) > (II) > (IV)

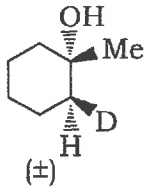
(C) (III) > (II) > (I) > (IV)

(D) (IV) > (I) > (II) > (III)

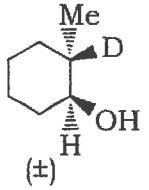
191. The major product formed in the following reaction



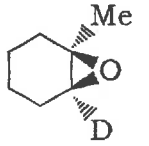
is

(A) 

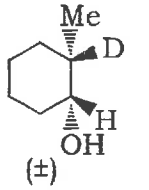
(±)

(B) 

(±)

(C) 

(±)

(D) 

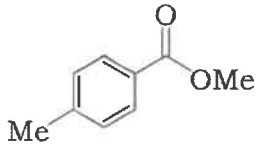
(±)

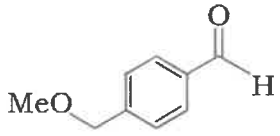
192. An organic compound having molecular formula $C_9H_{10}O_2$ exhibits the following spectral characteristics :

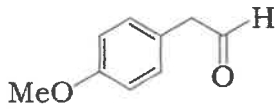
1H NMR : 9·72 (*t*, 1H), 7·1 (*d*, 2H), 6·7 (*d*, 2H), 3·8 (*s*, 3H), 3·6 (*d*, 2H)

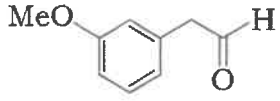
IR : 1720 cm^{-1}

The most probable structure of the compound is

(A) 

(B) 

(C) 

(D) 

193. The major product formed in the reaction of (2*S*, 3*R*)-2-chloro-3-phenylbutane with NaOEt in EtOH is

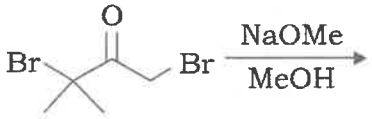
(A) (*E*)-2-phenyl-but-2-ene

(B) (*Z*)-2-phenyl-but-2-ene

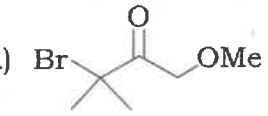
(C) 3-phenyl-but-1-ene

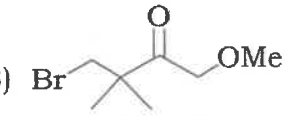
(D) (2*R*, 3*R*)-2-ethoxy-3-phenylbutane

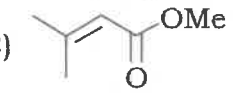
194. The major product formed in the following reaction

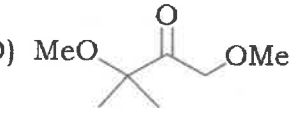


is

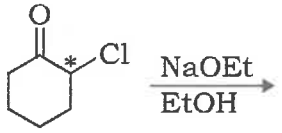
(A) 

(B) 

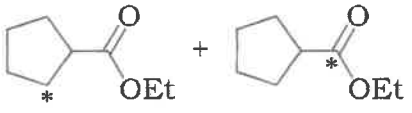
(C) 

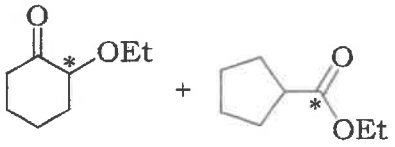
(D) 

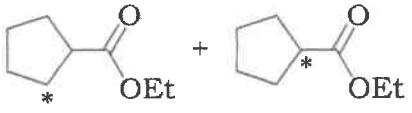
195. The ***correct*** option for the major product is

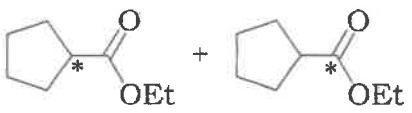


(* represents isotopically labelled carbon atom)

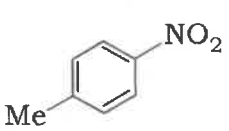
(A) 

(B) 

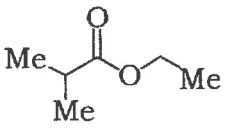
(C) 

(D) 

196. The number of proton NMR signals for the compounds *P* and *Q* respectively, is



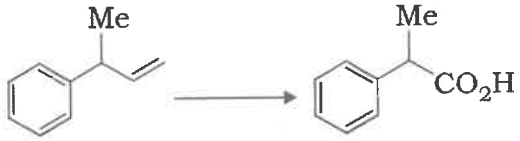
P



Q

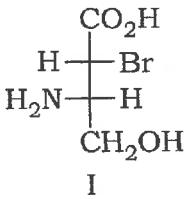
(A) 3 and 4
(B) 3 and 5
(C) 4 and 3
(D) 5 and 4

197. The following conversion is carried out using

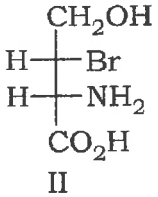


(A) hydroboration oxidation followed by Jones oxidation
(B) Wacker oxidation followed by haloform reaction
(C) oxymercuration-determination followed by Jones oxidation
(D) ozonolysis followed by haloform reaction

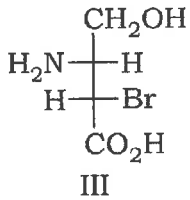
198. Among the following compounds, the pair of enantiomers is



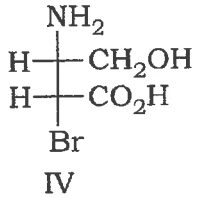
I



II



III



IV

(A) I and IV
(B) I and III
(C) II and III
(D) III and IV

199. The ***correct*** set of reagents for the following conversion is

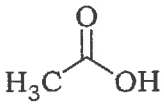
(A) *(i)* $NaNH_2$/liq. NH_3 *(ii)* $NaNO_2$/ dil. HCl *(iii)* CuCN, heat

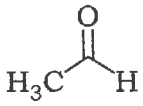
(B) *(i)* HNO_3/H_2SO_4 *(ii)* Zn/HCl *(iii)* $NaNO_2$/dil. HCl *(iv)* CuCN, heat

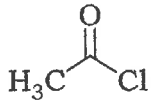
(C) *(i)* Mg/ether, H_3O^+ *(ii)* $(EtO)_2CO$ *(iii)* NH_4OH *(iv)* PCl_5

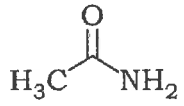
(D) *(i)* Mg/ether, H_3O^+ *(ii)* HNO_3/ H_2SO_4 *(iii)* $NaNO_2$/dil. HCl *(iv)* CuCN, heat

200. The carbonyl stretching frequency ($\nu_{C=O}$) is highest for

(A) 

(B) 

(C) 

(D) 

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SEAL

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